If one of these colonies be transferred to a sterile solution of calcium citrate, it invariably fails to set up a fermentation of the latter, the bacillus having thus by mere passage through the gelatin-medium lost its power to produce this effect. If, however, we take another similar colony and put it into a solution of broth containing calcium citrate, fermentation takes place; on now inoculating from this to a weaker solution of broth containing calcium citrate, this also is put into fermentation, and by proceeding in this manner we may ultimately set up fermentation in a calcium citrate solution which absolutely refused to be fermented when the bacilli were taken directly from the gelatin-plate.

Phenomena of this kind clearly indicate that there may be around us numerous forms of micro-organisms of the potentiality of which we are still quite ignorant. Thus, if we were only acquainted with the bacilli I have just referred to from gelatin cultures, we should be quite unaware of their power to excite this fermentation of calcium citrate, which we have only been enabled to bring about by pursuing the complicated system of cultivation I have indicated. It is surely exceedingly probable, therefore, that many of the micro-organisms with which we are already acquainted may be possessed of numerous important properties which are lying dormant until brought into activity by suitable cultivation.

This power of modifying the characters of bacteria by cultivation is, I venture to think, of the highest importance in connection with the problems of evolution, for in these lowly forms of life, in which, under favourable circumstances, generation succeeds generation in a period of as little as 20 minutes, it should be possible through the agency of selection to effect metamorphoses, both of morphology and physiology, which would take ages in the case of more highly organized beings to bring about.

We hear much about the possibility of altering the human race through training from the enthusiastic apostles of education, but even the most sanguine cannot promise that any striking changes will be effected within several generations, so that such predictions cannot be tested until long after these reformers have passed away. In the case of micro-organisms, however, we can study the effect of educational systems consequentially pursued through thousands of generations within even that short span of life which is allotted to us here.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. Peile, Master of Christ's College, has been re-elected Vice-Chancellor for the ensuing academical year.

The examination for the Diploma in Public Health will begin on October 4. Candidates are to send their names to the Registrary by September 27.

Prof. Roy announces a special course in Bacteriology, to be given during the long vacation by Mr. Adami, Mr. Kanthack (one of the Leprosy Commissioners), and Dr. Lloyd Jones, beginning on July 8. It is especially intended for candidates, not necessarily members of the University, for the Diploma in Public Health.

An elaborate scheme for the proposed Mechanical Sciences Tripos has been prepared by a special Syndicate, and appears in the *University Reporter* for May 31. The Tripos follows the main lines of the Natural Sciences Tripos, and seems to be free from the objections which have proved fatal to former schemes.

It is understood that the persons on whom honorary degrees are to be conferred on June 11, in connection with the Chancellor's inauguration, have been for the most part nominated by his Grace. This will perhaps account for the political character of the list, which is, however, partially relieved by the presence on it of General R. Strachey, and Mr. G. W. Hill, late of the office of the *American Ephemeris*, and known among astronomers for his fine work on the lunar theory. Five of the honorary graduates are Fellows of the Royal Society.

The University College of Wales, Aberystwyth, has been admitted to the privileges of a College affiliated to the University. The Mason College of Science, Birmingham, has been associated with the Local Lectures Syndicate in the work of University Extension.

Dr. W. Howship Dickinson, Dr. Bradbury, and Dr. J. F. Payne have been appointed Examiners in Medicine, Dr. W. S. Playfair and Dr. Griffith Examiners in Midwifery, and Messrs. Herbert Page, Frederick Treves, and Howard Marsh Examiners in Surgery.

Notice of opposition to the appointment of Sir R. S. Ball to the Directorship of the Observatory has been given. The grounds stated are that the duties of the Professorship of Geometry and Astronomy should occupy the whole time of the Professor, while the energies of the Director, in view of the recent developments of astronomical science, should be entirely devoted to the work of the Observatory. It is also held to be unwise in these circumstances to refuse the munificent offer of Mrs. Adams to provide £10,000 for the endowment of a separate Director.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 19.—"On the Changes produced by Magnetization in the Length of Iron and other Wires carrying Currents." By Shelford Bidwell, M.A., LL.B., F.R.S.

The changes of length attending the magnetization of rods or wires of iron and other magnetic metals which were first noticed by Joule in 1841, and have in recent years formed the subject of many experiments by the author, have been found to be related to several other phenomena of magnetism. Maxwell has suggested that they sufficiently account for the twist which is produced in an iron wire when magnetized circularly and longitudinally at the same time. The resultant lines of magnetization, as he points out, take a spiral form; the iron expands in the direction of the lines of magnetization, and thus the wire becomes twisted. Prof. G. Wiedemann, however, to whom the discovery of the magnetic twist is due, appears not to be satisfied with this explanation, believing the effect to be caused by unequal molecular friction.

The subject of magnetic twists has been very fully and carefully investigated by Prof. C. G. Knott, and in a paper published last year in the Transactions of the Royal Society of Edinburgh (vol. xxxvi., Part II., p. 485) he indicates many details in which the phenomena of twist closely correspond with those of elongation and retraction. Assuming their essential identity, and noting that "an increased current along the wire affects the points of vanishing twist in a manner opposite to that in which an increased tension affects it," Prof. Knott is "inclined to conclude that the pure strain effects of these influences are of an opposite character." Now, since the magnetic elongation of an iron wire is known to be diminished by tension, the remark above quoted amounts to a prediction that in an iron wire carrying a current the magnetic elongation would be increased. "We know nothing so far," Prof. Knott observes, "regarding the changes of length when an iron wire *carrying a current* is subjected to longitudinal magnetizing forces"; and it was with the object of acquiring some information on this point, and testing Prof. Knott's prediction, that the experiments described in the present paper were undertaken. The results show that it was amply verified, and thus Maxwell's explanation of the twist receives still further corroboration.

The apparatus used and the methods of observation were the same as those described in former papers. Each specimen of wire examined was 10 cm. long, and the indications of the instrument were read to one ten-millionth part of the length.

The wire first used was of soft commercial annealed iron, 0·75 mm. in diameter. The changes of length which it exhibited under the influence of magnetizing forces gradually increased from 13 to 315 C.G.S. units are indicated in the second column of Table I., in which the unit is one-millionth of a centimetre or one ten-millionth of the effective length of the wire.

The experiment described in the last paragraph was repeated while a current of 1 ampere was passing through the wire, the several magnetizing forces employed being made as nearly as possible the same as before by inserting the same resistances successively in the circuit. The results appear in the third column of Table I., and show that the maximum elongation had risen from 11·5 to 14·5 ten-millionths, while the decrement in a field of 315 had fallen from 22·5 to about 17·5.

The current through the iron wire was then increased, by an alteration of the rheostat, to 2 amperes, and, as appears in the last column of the table, there was again a marked increase of the maximum elongation, and decrease of the retraction in a field of 315.

TABLE I.—*Iron Wire, diameter* 0·75 *mm.*

Magnetic field due to coil. C.G.S. units.	Elongations in ten-millionths of lengths.		
	With no current through wire.	With 1 ampere through wire.	With 2 amperes through wire.
13	3	7	
16	6	9	11·5
23	7·5	12	
34	10	14·5	20
40	11·5	14	
50	10	14	20
61	9·5	12	
81	6	9·5	16
97	4	8	
130	0	3·5	8
171	-4	0	
202	-9	-4	-1
244	13·5		
250	—	-9	-5
315	-22·5		
319	—	-18·5	
323	—		-13

For the sake of easy comparison, the principal results obtained with this wire are collected in Table II.

TABLE II.—*Iron Wire, diameter* 0·75 *mm.*

Current through iron wire. Amperes.	Maximum elongation in ten-millionths of length.	Retraction in field of 315 C.G.S. units.	Field in which length is unchanged.
0	11·5	22·5	130
1	14·5	17·5	170
2	20	12	200

Similar experiments were afterwards made with nickel and cobalt.

A nickel wire was used, the diameter of which was 0·65 mm. The retractions which it underwent in fields of gradually increasing strength are given in the second column of Table III.

TABLE III.—*Nickel Wire, diameter* 0·65 *mm.*

Magnetic field due to coil. C.G.S. units.	Retractions in ten-millionths of length.		
	With no current through wire.	With 1 ampere through wire.	Difference.
12	8	8	0
15	10	11	-1
19	15	15	0
28	25·5	25	0·5
36	34	33	1
50	50	48	2
69	74	72	2
84	92	92	0
99	113	112	1
119	134	133	1
150	164	162	2
175	178	178	0
209	196	194	2
256	217	215	2
330	241	240	1

The retractions of the wire when carrying a current of 1 ampere, are given in the third column of the table. Remembering that the figures in the second and third columns denote millionths of a centimetre, the close agreement between the two is very remarkable. Such small discrepancies as exist can hardly be entirely accounted for by observational or instrumental errors; they are probably mainly due to the effect of the rise of temperature (2°·6 C.) caused by the current in diminishing the susceptibility of the nickel.

Tension has a large effect upon the magnetic retraction of nickel: it is, therefore, the more remarkable that the action of a current, which operates so markedly upon iron, should in nickel be practically insensible.

The results with no current obtained for a strip of rolled cobalt, the length of which between the clamps was 10 cm., and the cross section 1·82 sq. mm., are given in the first two columns of Table IV., and those with a current of 2 amperes in the third column.

TABLE IV.—*Cobalt Strip, section* 1·82 *sq. mm.*

Magnetic field due to coil. C.G.S. units.	Retraction in ten-millionths of length.		
	With no current through strip.	With 2 amperes through strip.	Difference.
34	1	1	0
50	2	2·5	-0·5
84	4	5	-1
100	6	6	0
119	7·5	8·5	-1
153	11	11·5	-0·5
209	16	16·5	-0·5
331	26	27·5	-1·5

From an inspection of the differences tabulated in the fourth column, it appears that the effect of the current is to increase the retraction very slightly.

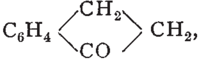
According to Rowland the susceptibility of cobalt is *increased* by heating. The small additional retraction indicated when the current was passing was, therefore, no doubt due to the increased susceptibility consequent upon current heating. It may be noted that tension seems to have no material effect upon the magnetic retraction of cobalt.

Summary.

In an iron wire carrying a current, the maximum magnetic elongation is greater, and the retraction in strong fields is less, than when no current is passing. The effect of the current is opposite to that of tension.

The magnetic retractions of nickel and of cobalt are not sensibly affected by the passage of a current through the metals. (Tension considerably modifies the magnetic retraction of nickel, but not that of cobalt.)

"The Human Sacrum." By A. M. Paterson, M.D., Professor of Anatomy in University College, Dundee, St. Andrews University. Communicated by Prof. D. J. Cunningham, D.Sc., F.R.S.

Chemical Society, May 19.—Prof. A. Crum Brown, F.R.S., President, in the chair.—The President announced that the Council had adopted a resolution expressive of the loss the Society and chemists generally had suffered by the death, on May 5, of Prof. von Hofmann. The resolution would be communicated to the family of the deceased, and to the German Chemical Society.—The following papers were read:—The magnetic rotation of compounds supposed to contain acetyl, or of ketonic origin, by W. H. Perkin. The author draws attention to Brühl's determination of the refractive powers of ethyl acetoacetate, which favours a ketonic constitution, and to its magnetic rotation, which was determined some years ago by himself, and which also supports this view. A list is then given of seven supposed acetyl compounds, of which he has ascertained the magnetic rotation, all giving numbers pointing to a ketonic constitution. As such compounds as these behave sometimes as ketonic and sometimes as hydroxy-derivatives, it was thought desirable to examine a larger number of compounds supposed to contain acetyl, or of ketonic origin, between wide limits of temperature. The following were selected: pyruvic acid, levulinic acid (fused and in solution), ethyl acetonedicarboxylate, ethyl acetoacetate, acetylacetone, methylacetylacetone, and ethyl β-amidocrotonate. The last-mentioned four were examined at widely different temperatures. The magnetic rotations of the first five substances agree with a ketonic constitution, though that obtained for ethyl acetonedicarboxylate is rather high. The rotation of acetylacetone is very high, showing it to be an unsaturated or hydroxy-compound, whilst the value obtained for methylacetylacetone stands between the hydroxy and ketonic rotations. At temperatures near 100°, however, these compounds give much lower rotations than when cold, showing apparently that they change into the more stable or ketonic form when heated. The refractive and dispersive powers of these compounds confirm the magnetic rotations. The magnetic rotation and the refractive and dispersive powers of ethyl β-amidocrotonate show it to be an unsaturated compound.—The origin of colour: ii. The constitution of coloured nitro-compounds, by H. E. Armstrong. The author has previously maintained that colour is conditioned by a quinonoid structure in the case of azo-dyes, such as the rosanilines, methylene-blue, &c. This view is clearly seen to be recommending itself to chemists. Nietzki makes reference to the quinonoid character of a number of dye-stuffs, although he does not seek to apply such a view at all generally. The author considers that, in the case of coloured compounds which have been fairly well studied, it is so generally true that a quinonoid formula is applicable, that the reconsideration of the formula of any coloured substance is warrantable if it do not come within the rule. The term "quinonoid" must, however, be understood to include compounds of the type of benzil, and in the case of closed chain compounds, it appears to be essential that at least one of the quinonoid carbon atoms be associated with a dyad radicle, and that the ring itself be unsaturated. The presence of two ortho- or para-carbonyl groups in a saturated ring apparently does not condition colour. Nitro-compounds as a class do not come within the suggested colour-rule. It is well-known, however, that nitro-compounds are not all coloured, many which are commonly described as yellow, being obtained white if prepared with care; from this it follows that the nitro-group does not *per se* condition colour. This is confirmed by a comparison of ortho- and para-nitrophenol. The ortho-compound is intensely yellow, very volatile, and insoluble in water; paranitrophenol is colourless, non-volatile with steam, and fairly soluble in water. Such a difference as this can hardly be ascribed to a mere change in the relative positions of the radicles. The difference is rendered all the more striking when the substances are contrasted with the methoxy-compounds prepared from ortho- and para-nitrophenol. These two substances are colourless, and agree as closely in their general properties as do most isomeric compounds containing the same radicles. It therefore appears justifiable to represent orthonitrophenol by a quinonoid formula—$C_6H_4 : O . NO_2H$, and to term it quinoneorthonitroxime. As only para- and ortho-compounds can have quinonoid formulæ, it would follow that metanitro-derivatives must be colourless; actually, however, metanitraniline has an intense yellow colour, but gives a colourless benzoate. The present view of its constitution therefore requires revision.—The origin of colour. iii. Colour as an evidence of isodynamic change: the existence of isodynamic acids, by H. E. Armstrong. The author applies the colour-rule dwelt on in the preceding paper to the cases of the coloured substances known as paradihydroxyterephthalic acid, dihydroxypyromellithic acid, and the corresponding "diamido" acids. These may be represented as quinonoid compounds, thereby accounting for their being coloured. Such substances as these readily change in type, yielding derivatives which may be colourless owing to conversion into an isodynamic form.—Studies on isomeric change, No. iv: Halogen derivatives of quinone, Part i., by A. R. Ling. Paradichloroquinone on bromination does not yield metadichlorodibromoquinone, as stated by Hantzsch and Schniter, but the normal product, paradichlorodibromoquinone. Contrary to the statement of Levy, this latter substance does not furnish chlorobromanilic acid on treatment with alkali, but a compound of one molecular proportion of chloranilate and two of bromanilate. Metadichloroquinone on bromination at a high temperature yields paradichlorodibromoquinone, but at ordinary temperatures the normal product, metadichlorodibromoquinone is chiefly obtained. A number of new compounds are described.—Halogen derivatives of quinone, Part ii., by A. R. Ling and J. L. Baker. Chlorotribromoquinone is prepared by brominating monochloroquinol and subsequently oxidizing the product. On treatment with alkali, it generally yields a molecular compound of the composition $C_6ClBr(ONa)_2O_2, 2C_6Br_2(ONa)_2O_2; 12H_2O$. Trichlorobromoquinone is obtained by brominating trichloroquinone. On treatment with soda, it yields the compound $C_6Cl_2(ONa)_2O_2, 2C_6ClBr(ONa)_2O_2; 10\frac{1}{2}H_2O$.—The crystalline forms of the sodium salts of substituted anilic acids, by W. J. Pope. A comparison of the crystallographic dimensions of the sodium salts of the brominated and chlorinated anilic acids referred to in the two preceding papers shows that the crystals possess considerable similarity.—Formation of a hydrocarbon, $C_{18}H_{12}$, from phenylpropionic acid, by F. S. Kipping. When phenylpropionic acid is treated with phosphoric anhydride, a resinous mass is obtained which contains at least three products. The first of these is a hydrocarbon, $C_{18}H_{12}$, which is oxidized by chromic acid mixture to a quinone, $C_{18}H_{10}O_2$. The hydrocarbon yields a dibromo-derivative, $C_{18}H_{10}Br_2$. The second product is a substance which yields a hydrazone of the composition $C_{15}H_{14}N_2$. It may possibly be  $C_6H_4\left\langle\begin{matrix}CH_2\\CO\end{matrix}\right\rangle CH_2$, owing to the fact that it seems to be formed on treating phenylpropionic chloride with aluminium chloride. The third substance produced seems to be an organic derivative of phosphoric acid.—Metallic derivatives of acetylene, by R. T. Plimpton. The silver compounds of acetylene, obtained by several methods, viz. by precipitation of silver acetate or ammoniacal silver nitrate solutions with acetylene, on analysis gave numbers lying between those required for $C_2Ag_2, \frac{1}{2}H_2O$, and $C_2Ag_2 . \frac{1}{3}H_2O$. Aqueous or alcoholic silver nitrate solutions yield precipitates varying in composition from $3C_2Ag_2, 2AgNO_3, H_2O$, and $C_2Ag_2, 2AgNO_3, H_2O$. Silver sulphate solutions gave a product of the composition $2C_2Ag_2, Ag_2SO_4, H_2O$. Mercuric acetate solution gives a white precipitate with acetylene, of the composition $3HgO, 2C_2H_2$, which is not explosive, and does not yield acetylene when treated with hydrochloric acid. In these two properties this substance differs from the precipitate obtained from mercurous acetate.—Isomerism amongst the substituted thioureas, by A. E. Dixon. The author has prepared and examined the properties of isomerides of methylphenylbenzylthiourea and dimethylphenylthiourea.—Note on diastatic action, by E. R. Moritz and T. A. Glendinning. The authors draw the following conclusions from a series of experiments on diastatic action. The attainment of a resting stage in the transformation of starch by diastase by no means shows that the energy of the diastase is exhausted. The energy of the "residual" diastase is, in fact, very considerable, but it is lessened to a marked extent by subjecting the diastase for some time to a temperature exceeding the optimum one for saccharification. When, however, it is not exposed for any length of time to a temperature exceeding the optimum, it appears capable, after transforming a considerable amount of starch, of transforming further quantities to nearly the same point, when such further quantities are added successively and subsequent to the attainment of the resting stage in the preceding transformation.

Zoological Society, May 17.—Prof. W. H. Flower, F.R.S., President, in the chair.—Mr. W. T. Blanford, F.R.S., exhibited and made remarks on the skin of a Wild Camel obtained by Major C. S. Cumberland in Eastern Turkestan.—In a paper on the geographical distribution of the Land-Mollusca of the Philippine Islands, the Rev. A. H. Cooke showed that the distribution of the different subgenera of *Cochlostyla* affords an interesting clue to the early relations of the various islands of the Philippine group. Regarded from this point of view, the central islands, Samar, Leyte, Bohol, Cebu, Negros, and Panay, with Luzon, were closely related, while Mindoro and Mindanao were remarkably isolated even from their nearest neighbours. An examination of the intervening seas accounted for these phenomena, the depths between the central islands being inconsiderable, while Mindoro and Mindanao are surrounded by very deep water. The Mollusca of the two ridges between the Philippines and Borneo, formed by Busuanga, Palawan, and Balabac, and by the Sulu Archipelago, were partly Philippine, partly Indo-Malay. Two remarkable groups of *Helix*, peculiar to Mindoro, Busuanga, and Palawan, showed relations with Celebes and possibly with New Guinea. The Mollusca of the Batan, Tular, and Talantse Islands were also discussed. Regarded as a whole, the Land-Mollusca of the Philippines were stated to contain: (1) Indo-Malay, (2) Polynesian, (3) indigenous elements, the first decidedly predominating.—A communication was read from Graf Hans von Berlepsch, and M. Jean Stolzmann, containing an account of a collection of birds made by M. Jean Kalinowski in the vicinity of Lima and Ica, in Western Peru. The species of which examples were obtained in the localities were eighty in number. In an appendix an account of previous authorities on the same subject was added.—Mr. G. A. Boulenger gave an account of *Lucioperca marina*, a rare species of fish, originally described by Pallas from the Black Sea and the Caspian, and little known of late years.—A communication from Mr. Oldfield Thomas contained a revision of the Antelopes of the genus *Cephalolophus*, of which eighteen species were recognized as valid. A new species was described as *Cephalolophus jentincki*, from Liberia.—Prof. Bell called attention to the remarkable amount of variation presented by *Pontaster tenuispinis*, numerous examples of which he had been able to examine and compare. He came to the conclusion that several North-Atlantic species, which had been described as distinct, should be regarded as belonging to it.—A communication was read from Mr. H. H. Druce giving an account of the Butterflies of the family Lycænidæ, of the South Pacific Islands. Of thirty-one species mentioned, seven were described as new to science.

Linnean Society, May 24.—Anniversary Meeting.—Prof. Stewart, President, in the chair.—The Treasurer presented his annual report duly audited, and the Secretary having announced the elections and deaths during the past twelve months, the usual ballot took place for new members of Council, when the following were elected: Messrs. E. L. Batters, William Carruthers, Herbert Druce, Spencer Moore, and Dr. D. H. Scott. The President and officers were re-elected. The Librarian's report having been read, and certain formal business having been transacted, the President delivered his annual address, taking for his subject "Commensalism and Symbiosis." On the motion of Dr. R. C. A. Prior, seconded by Mr. Jenner Weir, a cordial vote of thanks was accorded to the President for his able address, with a request that he would allow it to be printed.—The Society's Gold Medal was then formally presented to Dr. Alfred Russel Wallace in recognition of the service rendered by him to zoological science by numerous valuable publications. After Dr. Wallace had replied, the President announced the gift by Dr. R. C. A. Prior of an oxyhydrogen lantern for use at the evening meetings, and moved a vote of thanks to him for his valuable donation. This having been carried by acclamation, the proceedings terminated.

Cambridge.

Philosophical Society, May 2.—Prof. G. H. Darwin, President, in the chair.—The following communication was made:—Note on the application of the spherometer to surfaces not spherical, by Mr. J. Larmor. The ordinary form of spherometer, with equilateral triangular frame, gives a definite reading, when applied to a surface of double curvature, which corresponds to the arithmetic mean of the principal curvatures at the point; thus on a cylinder it will indicate half the curvature. It may be modified in various ways so as to measure both the principal curvatures by two observations.

May 16.—Prof. G. H. Darwin, President, in the chair.—The following communications were made:—Recent advances in astronomy with photographic illustrations, by Mr. H. F. Newall. A series of photographs was exhibited by the lantern and described, to illustrate recent progress in astronomical photography. The series included some interesting specimens taken with the Newall telescope, in which the object-glass is not specially corrected for photographic purposes.—On the pressure at which the electric strength of a gas is a minimum, by Prof. J. J. Thomson. The author showed that when no electrodes are present, the discharge passes through air at a pressure somewhat less than that due to 1/250 mm. of mercury; the discharge passes with greater ease than it does at either a higher or a lower pressure. Mr. Peace has lately shown that when electrodes are used, the critical pressure may be as high as that due to 250 mm. of mercury; so that as the spark length is altered the critical pressure may range from 250 mm. to 1/250 of a mm. It was pointed out that this involved the possession by a gas conveying the discharge of a structure much coarser than any recognized by the kinetic theory of gases. The author suggested a theory of such a structure, and showed that the theory would account for the influence of spark length and pressure on the potential difference required to produce discharge.—On a compound magnetometer for testing the magnetic properties of iron and steel, by Mr. G. F. C. Searle. An aluminium wire, 30 inches long, suspended vertically by a fibre, carries at the top a magnet fixed at right angles to the wire. The lower end carries a light fork across which a fibre is stretched horizontally. A mirror attached to this fibre carries a magnet at right angles to the fibre. The mirror is thus capable of two independent motions. The specimen of iron is placed in a magnetizing coil near the mirror, and the magnetizing current passes also round a coil placed near the upper magnet. The motion of the mirror is observed by the aid of a spot of light. On gradually increasing and diminishing the current, the spot traces out the well-known hysteresis curves.

Edinburgh.

Royal Society, May 16.—Sir Douglas Maclagan, President, in the chair.—The Astronomer-Royal for Scotland exhibited a stellar photograph, by Dr. Gill, of the Cape Observatory.—Dr. W. Peddie read a note on the law of transformation of energy and its applications. A generalization of the second law, applicable to forms of energy other than heat, was shown, by special examples, to lead to results already deduced by other methods.—Dr. C. G. Knott and Mr. A. Shand communicated a short note on the volume-effects of magnetization, which was supplementary to results communicated to the Society last year by the former author. When a particular size of iron tube was magnetized, the internal volume was found to undergo the following remarkable series of changes. In very weak fields there was first a slight increase, which, as the field was made stronger, passed through a maximum, then vanished and finally changed sign. From this point (about field 20) up to a field of 120 there was diminution of volume. This diminution was greatest in a field of 64. In fields higher than 120 there was again increase of volume, which attained a maximum about field 400, and fell off very slowly in higher fields. This curious variation of cubical dilatation with strength of field was shown to imply a transverse linear dilatation of (in general) opposite sign to the well-known longitudinal linear dilatation. The amounts, the positions of the maximum points, and of the vanishing points, of these correlated linear dilatations differed sufficiently in detail to produce this peculiar repeated change of sign in the cubical dilatation.—Dr. Hunter Stewart read a paper on the ventilation of schools and public buildings. The first part of the paper contained an account of an investigation as to the presence of organic nitrogenous matter in expired air. Several methods were used for absorbing and collecting these products, *e.g.* breathing through strong sulphuric acid, condensing the moisture from the breath, &c. The organic matter was determined by the process of Kjeldahl, by which the nitrogen is converted into ammonia. The results showed that each cubic foot of expired air contained on an average 0·01149 milligrams of ammonia as such, and 0·002 milligrams of ammonia derived from organic matter. The water condensed from 10 cubic feet of expired air contained on an average 0·5 milligrams of solid residue which entirely disappeared on ignition. These results, confirmatory of the observations of Hermann and Lehmann, proved that the organic matter in badly ventilated rooms did not come from the breath, but from the skin and clothing of the occupants. Since this must be variable, depending on obvious conditions, Dr. Stewart did not determine it, but relied on the estimation of the carbonic acid and moisture as a measure of the efficiency of the ventilation. The following are some of his results taken as averages:—

Edinburgh Hospitals, with 2000 cubic feet of space per bed—				
	Day	5·5	c.c. CO_2	per 10,000
	Night	5·85	,,	,,
Churches	Highest	63·5	,,	,,
	Lowest	20·0	,,	,,
Schools, with, per child,				
	154 c. ft. space and 9·8 sq. ft. area	9·9	,,	,,
	141 ,, ,, 8·8 ,,	13·3	,,	,,
	116 ,, ,, 7·1 ,,	17·2	,,	,,

All the schools and churches were without mechanical ventilation.—Prof. James Geikie read a paper on the glacial succession in Europe. The deposits which first give evidence of glacial action are generally referred to the Pliocene period. These are the oldest ground moraines of Central Europe, the ground moraine underlying the "lower diluvium" of Sweden, and the deposits of the Weybourne Crag with their Arctic marine fauna. Genial climatic conditions followed this period, with a wide land area, Britain being joined to the continent. Then followed the epoch of maximum glaciation, the Scottish and Scandinavian ice-sheets being continuous. Genial climatic conditions followed, Britain being again continental. Then submergence ensued to the 500-feet level, followed by another glacial epoch in which the Scottish and Scandinavian ice-sheets were again continuous. This was succeeded by genial conditions, Britain being once more joined to the continent. Submergence to the 100-feet level in Scotland followed, and then came Arctic conditions with local ice-sheets, succeeded by temperate conditions and the wide land area, and subsequently by submergence to the 50-feet level. Another cold period followed with local glaciers—the last in Britain.

Paris.

Academy of Sciences, May 30.—M. d'Abbadie in the chair.—Introduction of M. Guyon, the new member elected in the place of M. Richet.—Observations of the small planets, made with the great meridian instrument of the Paris Observatory during the second and third quarters of the year 1891, by M. Mouchez.—On the propagation of electrical oscillations, by M. H. Poincaré. The disturbance is supposed to be propagated along a thin straight conductor. The enfeeblement of the disturbance is theoretically shown to vanish when the diameter of the conductor becomes indefinitely small.—Another blow to the ascent theory of cyclones, by M. Faye. A discussion of recent observations, showing that cyclones are not produced by convection from the soil, but by disturbances in the general circulation of air in the higher regions.—On the monkey of Montsaunès discovered by M. Harlé, by M. Albert Gaudry. A portion of the mandible of a monkey, containing three teeth, was exhibited, found by M. Harlé, engineer at Toulouse, in the Quaternary of the Haute-Garonne. It shows the greatest similarity with the magot of Gibraltar and Algiers.—Physiological effects of a liquid extracted from the sexual glands, and especially the testicles, by M. Brown-Séquard.—On the relations of the Devonian and Carboniferous formations of Visé, by M. J. Gosselet.—Study of the physical and chemical phenomena under the influence of very low temperatures, by M. Raoul Pictet. The calorific æther waves corresponding to low temperatures are found to traverse all bodies with hardly any resistance. A test-tube filled with chloroform was placed in a nitrous oxide refrigerator at – 120°. A thermometer in the tube showed a gradual fall to – 68°·5, when crystallization commenced. On removing the test-tube to a refrigerator at – 80°, the temperature indicated by the thermometer *fell rapidly* from – 68°·5 to – 80°, while the crystals formed on the walls of the test-tube fused and disappeared. On replacing it into the – 120° refrigerator, the temperature rose to – 68°·5, and the crystals reappeared. M. Pictet explains these extraordinary phenomena by supposing his thermometers to have acted more as thermodynamometers than as thermoscopes. While the crystals were forming in the first refrigerator, the radiation from the bulb was neutralized by the latent heat given out by the chloroform in crystallizing, whereas in the warmer refrigerator the crystals did not form, and radiation alone was active. Alcohol and sulphuric ether thermometers were used, which were checked by thermometers containing dry hydrogen at four different pressures.—On rectangular co-ordinates, by M. Hatt.—On the application of the optical properties of minerals to the study of the inclosures in volcanic rocks, by M. A. Lacroix.—On a property common to three groups of two polygons, inscribed, circumscribed, or conjugate to the same conic, by M. Paul Serret.—On the canonical developments in series the coefficients of which are differential invariants of a continuous group, by M. Arthur Tresse.—On the calculation of the coefficient of resistance of air, supposing the resistance proportional to the fourth power of the velocity, by M. de Sparre.—On a means of bringing two non-miscible liquids into intimate contact in definite proportions, by M. Paul Marix. This is done by pouring both liquids into the same vessel at a definite rate, and allowing them to leave it by an orifice in the side. They will escape together in the proportion of their volumes, if the level of the liquid is maintained uniform by a constant supply. The surface of separation is invariably found at the level of the orifice, and if a flattened spout is used, a lamellar arrangement of the liquids is produced, thus giving a large surface of contact.—On a hydro-silicate of cadmium, by MM. G. Rousseau and G. Tite. This is produced by the action of the glass vessel when the solid hydrate of neutral cadmium nitrate is heated to about 300°. On dissolving away the basic nitrate with boiling alcohol, the silicate can be detached from the glass in long scales by hot water. Its formula is $2(CdO, SiO_2) . 3H_2O$.—On the decomposition by heat of ammoniacal pentachloride of phosphorus, nitrochloride of phosphorus, and phosphame, by M. A. Besson.—On the phosphates of strontium, by M. L. Barthe.—The calorific power of pit-coal and the formulæ by means of which its determination is attempted, by M. Scheurer-Kestner.—Mechanical determination of the boiling-points of terminal complex substitution products, by M. G. Hinrichs.—On some reactions of the three amido-benzoic acids, by M. Œchsner de Coninck.—On the composition of chlorocruorine, by M. A. B. Griffiths.—On the antiseptic properties of formaldehyde, by M. A. Trillat.—The nervous system of the Neritidæ, by M. E. L. Bouvier.—On the osteological characters of a male *Mesoplodon Sowerbyensis* recently stranded on the French coast, by M. P. Fischer.—On a new species of *Gammarus* of the Lac d'Annecy, and on the fresh-water Amphipoda of France, by MM. E. Chevreux and J. de Guerne.—Action of various toxic substances on *Bombyx Mori*, by M. J. Raulin.—On the genetic relations of resinous and tannic substances of vegetable origin, by MM. Edouard Heckel and Fr. Schlagdenhauffen.—Researches on the grafting of Crucifers, by M. Lucien Daniel.—Contribution to the study of the toxic effect of the diphtheria bacillus, by M. Guinochet.—Contribution to the knowledge of the Saharian climate, by M. Georges Rolland. A summary of observations made at a meteorological station in the oasis of Ayata, in Southern Algiers. The sparse vegetation found here and there seems to derive its moisture from subterranean sources, whence it ascends by capillary attraction, and from certain deliquescent salts found in the soil which absorb moisture at night.—On a passage in Strabo relating to a treatment of the vine, by M. Ant. Aublez.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—La Distribution de L'Électricité, *Usines Centrales*: R. V. Picou (Paris, Gauthier-Villars)—Travail des Bois: M. Alheilig (Paris, Gauthier-Villars).—Medical Electricity: Drs. Steavenson and Jones (Lewis).—First Report of the U.S. Board on Geographic Names, 1890–91 (Washington).—Smithsonian Report, 1890 (Washington).—Lehrbuch der Zoologie: Dr. R. Hertwig, 2 vols. (Jena, Fischer).—Ziele und Wege Biologischer Forschung: Dr. F. Dreyer (Jena, Fischer).—Key to Arithmetic for Beginners: J. Brooksmith and E. J. Brooksmith (Macmillan).—Transactions of the Sanitary Institute, vol. xii. (Stanford).—Bibliography of the Algonquian Languages: J. A. Pilling (Washington).—A Monograph of the Myxogastres: G. Massee (Methuen).—Popular Readings in Science: J. Gall and D. Robertson (Constable).—Researches on Micro-Organisms, Dr. A. B. Griffiths (Baillière).—Darwin et ses Précurseurs Français, deux. édtn., A. de Quatrefages (Paris, Alcan).—Trattato di Fisico-Chimico secondo la Teoria Dinamica: E. dal Pozzo di Mombello (Milano).

Pamphlets.—The Orthoceratidæ of the Trenton Limestone of the Winnipeg Basin: J. F. Whiteaves (Montreal, Dawson).—Ursachen der Deformationen und der Gebirgsbildung: Dr. E. Reyer (Leipzig, Engelmann).

Serials.—Journal of the Chemical Society, June (Gurney and Jackson).—Meteorological Record, vol. xi., No. 42 (Stanford).—Quarterly Journal of the Royal Meteorological Society, April (Stanford).—Geological Magazine, June (K. Paul).—Natural History Transactions of Northumberland, Durham, and Newcastle-on-Tyne, vol. xi., Part 1 (Williams and Norgate).—The Yale Review, vol. i., No. 1 (Arnold).—Bulletins de la Société d'Anthropologie de Paris, July to December, 1891 (Paris, Masson).—Archives de Sciences Biologiques publiées par l'Institut Impérial de Médecine Expérimentale à St. Pétersbourg, tome i., Nos. 1 et 2 (St. Pétersbourg).—Engineering Magazine, June (New York).—Himmel und Erde, June (Berlin, Paetel).—Journal of the Straits Branch of the Royal Asiatic Society, June Singapore).

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